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ABSTRACT

Eight propositions regarding the interaction of teachers and students to create educational outcomes are presented and discussed: 1. It is necessary to look at both cognitive and affective outcomes whenever we want to evaluate the effectiveness of teachers, or an educational program. 2. There is a need for more research on the reciprocal interactions that constitute the learning process, e.g., the ways in which student behavior and teacher behavior affect each other. 3. There are important differences in the dynamics of the learning process among students from different cultures and no single teaching style works equally well with all of them. 4. Differential educational strategies must be designed that will somewhat equalize the educational outcomes between middle class children and the lower socioeconomic level children. 5. The emotional adjustment of students often has a powerful facilitating or deterrent effect on their mastery of cognitive skills. 6. To study each of these problems requires a research design that looks at the interacting effects of teacher and student characteristics on multiple educational outcomes. 7. The most effective learning systems deal with each student's individual learning needs. 8. The major task of the future is the implementation of these educational strategies. (JMF)

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# HOW DO TEACHERS AND STUDENTS INTERACT TO CREATE THE OUTCOMES OF EDUCATION?

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NATIONAL INSTITUTE OF EDUCATION

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# How Do Teachers and Students Interact to Create the Outcomes of Education?

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I should like to state eight propositions and then give some evidence in support of each one.

1. Sometimes, when teachers get students to learn subject matter, they also teach them to dislike the learning process, or they do it in a way that injures students' self-esteem. Consequently, "effective teaching" should not be judged by a single criterion, such as subject matter learning. Multiple criteria should be simultaneously assessed, such as effects on students' self-esteem, effects on attitudes toward learning, and effects on students' ability to cope effectively with problems on their own initiative.
2. Students affect teachers' behavior just as teachers affect students' behavior. This interaction process also needs to be recognized and studied.
3. There are important differences in the dynamics of the learning process among students from different cultures. No single style of teaching works equally well with all of them.
4. The most important educational challenge, worldwide, is to design differential educational strategies that will somewhat equalize the educational outcomes between middle-class children and the fifty to seventy percent of children below that socioeconomic level.

5. The emotional adjustment of students often has a powerful facilitating or deterrent effect on their mastery of cognitive skills.
6. To study each of these problems requires a research design that looks at the interacting effects of teacher characteristics and student characteristics on multiple educational outcomes.
7. The most effective learning system is one which also follows this design, identifying and addressing each student's individual learning needs. Both cognitive needs and affective needs should be given attention. A system with these characteristics has been developed, tested and proven workable for the education of teachers.
8. Even when improved, empirically validated educational strategies have been worked out, the greatest task still lies ahead: to get them installed and used in an insightful, inventive, continuing way.

Proposition One: The Need to Measure Multiple Outcomes

Evidence for this proposition comes from a study in which a sample of teachers was selected whose successive classes, over three years, showed a consistent level of low, average or high gain in standardized achievement scores (Brophy, 1973). Substantial reversals are found in the relationships among pupil-achievement gains, pupil evaluations of teachers' affective impact on them, and teachers' self-reported feelings of personal adequacy (Peck and Veldman, 1973). Those teachers whose pupils make the greatest standardized test gains also tend to be least liked by pupils for the way

they make the pupils feel about themselves (the correlation with MAT gain-score is -.44) and for the low interest value of their classes (-.52).

Correlations between pupil gain-scores and teachers' self-reports of their own personal characteristics show a similar, negative relationship. For example, teachers' self-rated "idealism" and "attractiveness" scores correlate -.56 and -.49 with pupils' gains on the Metropolitan Achievement Test average score. Teachers' feelings about work, about parents and about the future, correlate -.30, -.53 and -.50 with pupil gain scores. A general self-concept score for teachers correlates -.59 with pupil gain. In short, in this study, pupil gain in standardized achievement scores is accompanied by negative pupil attitudes about the way their teachers treat them. Furthermore, the higher the level of pupil gain, the less the teacher expresses self-esteem or a sense of taking control of her own life. Similar results are reported in a study just completed by Manatt, Engel and Netusil (1975).

Although it seems most unlikely that so strongly negative a relationship would be found between cognitive and affective outcomes in a large, representative sample of the nation's classrooms, the very fact that it occurs even once, as in this study, emphasizes how necessary it is to look at both cognitive and affective outcomes whenever we want to evaluate the "effectiveness" of teachers, or of an educational program.

Proposition Two: The Reciprocity of Teacher-Student Interactions

Proposition Two is illustrated by a current study (Evertson, Brophy, et al., 1975) in which second through fifth-grade students have been ranked consistently on a number of traits by two successive teachers. Thereafter, their interactions with their teachers have been observed and coded. Here are some of the findings.

Students who rank high on "looks you in the eye" and "happy" receive high rates of response opportunities. They also volunteer more answers in small groups and in class discussions. Students seen as "standing out" get many response opportunities in class. They call out their answers more often and tend to be criticized more for their eagerness. "Standouts" receive a high proportion of behavior contacts from the teacher, including both praise for good behavior and threats or criticisms for misbehavior.

At the other extreme, students seen as "hardly noticeable" are called on more often by the teacher for small group response opportunities. They are called on more (without volunteering) in general class discussion, as well. They are praised more when they do volunteer, however. They also initiate more work contacts with teachers and teachers initiate more contacts with them. They receive more praise for work and generally more positive reactions from the teachers.

"Happy"students get more behavioral praise, more response opportunities, more positively reinforcing teacher contacts, and a higher proportion of classroom housekeeping jobs. Students seen as "unhappy" do more hand-waving or eager volunteering in small groups but are called on less often. They receive more private work contacts and have more behavior contacts of a negative nature. "Unhappy" students also sass or defy the teachers more and have more disciplinary contacts followed by warnings and threats. They receive more praise for good work and more criticism for poor work.

There is evidence from other parts of this research program,known as the Student Attribute Study, that the accuracy of the teachers'

descriptions is strongly confirmed by independent evidence. The teachers are responding to genuine properties of the different students, not just reacting to a subjective impression in a way that becomes a self-fulfilling prophecy.

This research follows a line of work initiated by Brophy and Good which has repeatedly demonstrated ways in which student behavior tends to affect teacher behavior, just as teacher behavior often shapes student behavior. This is one of the relatively rare examples of research on the reciprocal interactions that constitute, and explain, the learning process.

Proposition Three: Cultural Differences in the Dynamics of Learning

This proposition can be illustrated with findings from the first year of the Teaching-Learning Interaction study (Peck, 1975). Black sixth graders in integrated classrooms who are rated low by their peers, at the year's start, for working hard and for getting along with people in school, actually lose considerable knowledge over the year, as measured by a standardized test of subject matter mastery. Conversely, Blacks who are rated high at the outset, perform at year's-end as their initial test scores would have predicted. They do not lose ground in their knowledge of subject matter.

The pattern for Mexican-American children is similar, but less extreme in the amount of loss experienced by those rated low on their orientation towards school.

This differential pattern does not show up among Anglo children in the same classrooms. They gain just about what their pretest scores would predict, no matter what their initial peer rating on school orientation.

Looking at a different but equally important kind of outcome, the self-esteem of Black children is strongly affected by their teachers' own level of self-esteem, in a way that does not hold true for their Anglo or Mexican-American classmates. Black children who are rated low on emotional adjustment by their peers in October, show a large loss in self-esteem by April if their teacher scores relatively low in self-esteem. Even with teachers who express average or high self-esteem, the low-rated Black children show a moderate loss in self-esteem over the year. (Fifty percent of the Black children in this study were rated by their classmates in the lowest third of the total school population, on emotional adjustment; this is quite unlike the even distribution along the scale of Anglo and Mexican-American children.) Highly adjusted Black children, on the other hand, show much less vulnerability to the negative effect of a teacher with low self-esteem. Even they are more susceptible to teacher influence than children in the other ethnic groups, however, for they show a strong gain in self-esteem when placed with teachers who show high self-esteem.

Anglo children's self-esteem is not much influenced by their teachers' self-esteem, except for a moderate gain when placed with highly self-esteemed teachers.

Mexican-American children's self-esteem is not much influenced by their teachers' self-esteem, either; but their beginning-of-year emotional adjustment has a strong effect. Those rated least adjusted in October show a marked loss in self-esteem over the year; those rated well-adjusted show positive gains in self-esteem, whether their teachers' self-esteem is high or low.

Thus, each child's initial emotional adjustment and each teacher's level of self-esteem interact in a different way for Black, Mexican-American and Anglo-American children who are in the same classrooms. There is a uniquely different set of effects on the children in each of these ethnic groups.

Still another finding illustrates the fallacy of assuming that a good-sounding style of teaching is always good for all students. One of Ryans' major factors, measured by direct observation of teachers' classroom behavior, is "Stimulating, Inventive." While this teaching pattern is associated with greater-than-expected gain in achievement scores for a certain kind of student, those rated high on emotional adjustment, it is associated with a moderate loss in achievement scores among students who are low on emotional adjustment.

There is also an important cultural difference. Teachers with a high score for stimulating, inventive teaching show a strong, unexpectedly negative effect on the self-esteem of Black students. Indeed, even teachers who are average in this respect have a slightly negative effect on the self-esteem of Black students.

No such effects are visible, in either direction, on the self-esteem of Anglo students. Mexican-American students show a slight positive gain with highly stimulating teachers; slight losses, with teachers who are average or low on this characteristic.

It looks as if Black children may all too easily feel overwhelmed and increasingly inferior when placed with a teacher who is lively, dynamic and has many ideas. This is certainly an unintended effect, for most

teachers who are rated high on this dimension are not dogmatic, egotistical or overweening; they are just being themselves when they generate ideas. Indeed, they would not be rated high if they were not trying hard and successfully to think of ways to spark student interest or to meet special needs of their students. Nonetheless, if this finding holds up in the replication study which is now in progress, it will furrow the brow of some of our best teachers, and their administrators, to figure out ways to keep the advantages of this style of teaching but to forestall the unexpectedly deleterious effects the Black students show.

Proposition Four: The Interaction of Social Class with Instruction

In a ten-year, cross-sectional study ("Coping Styles and Achievement") carried out in eight countries (Brazil, England, Germany, Italy, Japan, Mexico, the United States and Yugoslavia) the most outstanding finding is not one of national or sex or age differences, but the large, systematic deficit in educational achievement of skilled working-class youth, compared with upper-middle-class youth, at ten and fourteen years of age, in all countries (Peck, et al., 1972; Peck, et al., 1973). What is more, the working-class youth show many parallel deficits in coping skills and in self-esteem in most of the countries. As might be expected, numerous interaction effects are observable, for such combinations of factors as class by age, class by sex and age by sex.

The socioeconomic differences are actually underestimates of the true discrepancy. For example, at least fifteen to twenty percent of the Anglo, ten-year-old, working-class children who were in school in Texas proved to be functionally illiterate and had to be excluded from the sample

used in this study. Furthermore, by fourteen, many of the academically least effective students had dropped out of school, in most countries.

Since it is all too well established that children from the lowest SES level, who were not included in this study, show even poorer academic achievement in all countries, the conclusion is inescapable that none of these countries has found an effective way to educate the children from the lower fifty to seventy percent of its population. This finding parallels the findings from the International Study of Educational Achievement (Husen, et al., 1967; Husen, 1972), the Coleman report (1966), Jencks, et al (1972), and many other studies (Bryant, et al, 1974). Standard schooling works very differently for these children than for middle-class children. In the United States, this means that the children from the lower half of the socioeconomic range (at least fifty percent of the elementary school population) are much less likely to master the standard academic skills than are their middle-class schoolmates. There is, in short, a powerful "interaction effect" whereby the absence of a differentiated treatment produces this large inequality of educational outcomes.

Tyler (1951) proposed that this deficit might be made up by providing lower-class children with some of the practice that middle-class children get outside of school. Merely adding more hours to the school day, with the same instructional procedures, probably would not get to the heart of the problem. Brophy and Evertson (1975) report systematic differences in the teaching techniques that produce achievement-test gain with young students of low and high socioeconomic status. Stallings' paper for this conference contains perhaps the largest, most solid body of evidence ever assembled that bears on this issue (Stallings, 1975).

Perhaps another, crucial key to the problem comes from the evidence of important social class differences in parental example (Marjoribanks, 1971) and in parental "teaching techniques" (Blau, 1972; Greenberg and Davidson, 1972; Kohn, 1969). A number of pilot programs have been mounted by school systems and by state education agencies for innovation, in the past decade. Some of them reach out to involve lower-class parents much more actively and continuously in the schooling process; some, to provide new kinds of training for parents which help them teach their children coping skills that give them a better preparation for school. All of this together, if it were tested, systematized and made a permanent part of our educational system (in the broadest sense of that term) might substantially improve the motivation, the coping skills and the academic achievement of our undereducated majority.

## Proposition Five: The Interaction of Affective and Cognitive Factors

Many of the findings used to illustrate Proposition Three also illustrate this proposition, as well. There are additional findings from that study which further illustrate the influence of emotional adjustment on cognitive performance. For example, sixth graders who score high on a pre-test of academic achievement make better than expected scores on the achievement post-test if they also are rated high on emotional adjustment, by peers, at the beginning of the year. They do not gain ground -- nor lose it -- if they are average or low in emotional adjustment. Students who score average on the achievement pre-test score lower than expected on the post-test if their emotional adjustment is average or low. Students whose

beginning achievement level is low similarly lose a little ground over the year in their academic achievement if their emotional adjustment is low. Looking at it the other way, students who are in good mental health gain ground over the year in their knowledge of subject-matter compared to the total sixth-grade population, if they start the year at an average or better level of achievement. Students whose adjustment is relatively poor and whose mastery of subject matter is poor or even average, to begin with, lose ground over the sixth grade. They fall even farther behind the other students than they were at the beginning of the year.

Incidentally, these very sizable differences in outcome are all the more striking when one considers that the particular test that was selected by the school staff as an achievement measure, the McGraw-Hill Comprehensive Test of Basic Skills, shows extremely little change in mean item scores over the sixth grade. This is true not only in the population in this study, but in the CTBS national standardization sample. The typical gain on a 38 or 40-item sub-test is one or one and a half items.

Furthermore, there are no systematic "main effects" for the different teachers (or classrooms). Teacher characteristics do appear to bring about real gains or losses, but only in ways that have different effects on different kinds of students. Moreover, with respect to the affective side of learning, teachers' feelings have a definite impact on students' feelings, in numerous ways, as illustrated above.

## Proposition Six: The Need for the Interaction Paradigm in Research on Learning

In each of the studies cited above, the use of an interaction paradigm has demonstrated that learning outcomes can only be explained as the resultant of an interplay of forces. Studies that fail to allow such interactions to be measured, simply cannot arrive at an accurate map of the

complex world of everyday learning. There are problems aplenty in this approach. Even in the course of updating his argument for a multivariate approach to the study of behavior, Cronbach (1975; and in personal communication) points to troublesome limitations in our best, present quantitative methods for handling such issues. Nonetheless, he sees almost no validity at all in more simplistic approaches. Hunt (1975) presents a recent review of the evidence and the logic for what he calls the Person-Environment-Interaction paradigm. He proposes four essential elements for such a model: that it look at multiple behavioral outcomes; that it be "developmental," over some appreciable period of time; that it look at the reciprocal interactions between person and environment; and that it be "practical."

The series of studies cited here do look at multiple outcomes; they observe learning over a full year or two of schooling; one of them specifically focuses on reciprocal interactions, in detail; and all attempt to be practical, both by looking at learning in its natural settings, in school (or college; see Proposition Seven, below) and by assessing outcomes that are widely held to be important. These particular studies have grown out of the multidisciplinary tradition of the Committee on Human Development of the University of Chicago, represented by the work of such people as Havighurst, Warner and Prescott. That tradition embodies the same debt to Kurt Lewin that Hunt acknowledges.

A considerable number of other studies have used some form of the interaction paradigm. As early as 1944, Thompson and Hunnicutt reported that "introverted" students performed better when praised by their teachers,

whereas "extroverts" performed better when criticized by teachers for their mistakes. Heil (Washburne and Heil, 1960) reported that teacher personality interacted with child personality to create differential learning in different types of children, with different patterns for different elementary school subjects.

Cronbach (1957) strongly recommended that an interaction paradigm be adopted as the best logical model for tracing educational effects to their actual causes because that better approximates the complex realities of everyday learning. Subsequently, quite a few studies attempted to embody this approach, although many of them used a very narrow definition of "aptitude-treatment interaction." Moreover, according to Bracht (1970), "the analysis of an interaction effect was often an afterthought rather than a carefully planned part of an experiment." Nonetheless, Glass (in Wittrock and Wiley, 1970) concluded, "ATI has not paid off."

On the other hand, Cronbach and Snow (1969) found that the interaction approach explained learning better than the single-predictor model. Lesser (1971) cited a substantial number of other studies in support of this approach. Berliner and Cahen (1973) did not find as powerful confirmation of the trait-treatment interaction model as they expected, but they did see hope for it in better-conceived studies. Koran (1971), reporting a study with numerous interaction effects, observed "as Cronbach and Gleser have suggested (1965), initial study of aptitude X treatment interactions will quite possibly be more important for what it tells us about the psychology of instruction than for immediate placement purposes. However, such experimentation may eventually help provide a basis for the individualization of instruction."

Britt (1971) described an intriguing, computerized method of identifying "learner types" which, from the defining statements, also specifies the characteristics of differentiated instructional programs that should optimize the learning of each "type." He did not, however, cite evidence of the observed effectiveness of such differential instruction, in practice. Salomon (1971) reviewed a number of studies that showed important ATI effects. His 1972 paper describes ways in which ATI effects can be turned into specifications for differential programs of instruction for different kinds of learners (Salomon, 1972).

Studies reporting significant trait-treatment interaction effects that have not been cited in earlier reviews, include those by Berliner, 1972; Blitz and Smith, 1973; Britt, 1971; Brophy, 1975; Cronbach and Snow, 1969; Davis, 1967; Dowaliby and Schumer, 1973; Featherstone, 1973; Fisher, 1973; Kress and Gropper, 1966; Lippman, 1970; Pervin, 1968; Shores, 1969; Smith, Wood, Downer and Raygor, 1956; Tallmadge and Shearer, 1971; and Taylor, 1970.

It is easy to sympathize with the critics of the PEI approach. In struggling to use it in various action-research and pure research studies here at The University of Texas over the past twenty years, we have found that is it difficult and expensive to conceptualize this approach sharply, to instrument it soundly, to carry it out in practical settings, and to analyze it soundly. Many of the necessary statistical procedures, for example, have only been developed into a complete, usable system within the past four or five years, some of them here. Nonetheless, every time we have used this approach it has proved out. Indeed, we are persuaded by now that it is every bit as essential to an accurate, insightful, useful analysis of human learning and human development as we initially supposed it might be.

One of the additional virtues of this multi-faceted way of trying to map reality is that it seems to prepare one to notice factors in the learning situation that were not foreseen in the initial formulation of a particular study. Perhaps anyone who studies people in real life settings has a better chance to notice such "excraneous" but crucial factors. The PEI model, however, seems to prepare the mind especially well to make such serendipitous discoveries.

## Proposition Seven: The Interaction Paradigm in the Design of Educational Systems

One example of a program designed to operationalize the PEI paradigm is the Personalized Teacher Education Program that was evolved at The University of Texas at Austin since 1956 (Peck and Bown, 1964; Peck, 1970), first with Hogg Foundation and NIMH support, then with OE and NIE support through the R&D Center for Teacher Education. This program contains many of the elements described by Goldschmid and Goldschmid (1973), plus some unique processes such as personalized assessment feedback and performance feedback, carried on repeatedly by a multidisciplinary faculty team. Two successive examples of this program have been evaluated, using an interaction model, one during 1962-67 (Peck, 1962; Fuller, Peck, Bown, Menaker, White and Veldman, 1969; Menaker, Peck and Veldman, 1972); the other, in 1972-73 (Borich, Godbout, Peck, Kash and Poynor, 1974; Haak and Peck, 1974).

Findings from the latter study illustrate both why an interaction model is essential in order to understand what goes on in any educational program, and why it is desirable to conduct education in a "personalized" way, deliberately differentiated on the PEI model, if optimal outcomes are to be achieved. Among the findings are patterns such as these:

Young women who start into student teaching with a high anxiety level but who attribute this to the adults they must deal with, not the children, and who actively seek and use feedback, end up being judged effective teachers. Women who fundamentally fear and distrust adults but who rather successfully conceal this through surface conformity and through defensively denying their problems, are judged ineffective by the end of student teaching.

The characteristics embodied in these descriptions have been found to respond differently to different kinds of training, in a comparison of a Personalized Teacher Education Program with a conventional program. Overall, students who begin with high anxiety, with a relatively low attitude toward children, or with a below-average score on any of twenty other significant characteristics, are likely to improve most, in that respect, in a personalized program of instruction.

A "personalized" program is not a monolithic program; it addresses itself differentially to just those characteristics which each different student most wants and/or needs to improve. The results of this study underline the necessity for this personalized approach, for it turns out that most students have a quite variable profile on these teaching-relevant characteristics. A student who is quite anxious, and thereby will profit from personalized attention to reducing that anxiety, may simultaneously start out with a very positive attitude toward children which requires no special attention in the course of training. Thus, while students who are above average in any one characteristic, to begin with, profit as much or more from conventional teacher education with respect to that one characteristic, they would profit more from a personalized program in other characteristics where they are relatively ineffective to begin with. Therefore, entering

status on any one characteristic cannot be used efficiently to assign people to a conventional or personalized program. The particular "learning needs profile" of each student teacher needs to be determined and skillful, constructive attention needs to be given to those characteristics where the student is below par. The student can usually be left free to use and develop his or her other characteristics without any special intervention. This, of course, is what a personalized program does, that conventional programs do not do, to anything like the same extent or with the same precision.

In both of the comparative evaluations of the outcomes of personalized versus conventional programs, the evidence indicates that instruction tailored to students' individual learning needs, affective as well as cognitive, produces more effective teachers than does a conventional, more group-oriented kind of instruction.

The same logic would seem to apply to the design of education at any age level. If, as has been demonstrated, different students need different treatments, and if affective elements are as important as cognitive elements, education at all levels will work better to the degree that it is both individualized and personalized (through insightful attention to the personal values, needs and behavior style of each individual, and through providing well-tailored, constructive human relationships as part of the teaching-learning process). The question is not whether it would be better, but how it may be done with reasonable cost and with practical ways of insuring that it is kept working effectively.

## Proposition Eight: The Hardest Step is Putting a Revised System into General Practice

Gene Hall's paper for this conference addresses this issue with empirical data and with a conceptual system for identifying the stages through which

people move, if and as they adopt an educational innovation (Hall, 1975). I would merely illustrate this point, which all of us know too well, with a sketch of some of the human and institutional obstacles we have encountered while helping teacher education institutions adopt or adapt major elements of the Personalized Teacher Education system.

If differentiated instruction is to be put into everyday practice, it turns out that certain changes have to be made in faculty role-assignments, in order for such a program to cost no more than present methods of college instruction. For instance, a trained counselor needs to spend half or more of his time giving personalized assessment feedback and performance feedback to his students; not spend all of his "work-time" teaching courses in Educational Psychology. An expert in teaching methods needs to be freed and paid to work with students in their "practice school," along the teaching center model, not spend most of his time on group instruction in a campus classroom. Some instructors need to be freed of direct instructional activities, for at least half their time for several years, in order to develop, test and refine instructional modules that students can use according to Keller's Self-Paced, Proctored Instruction Model (which its practitioners have recently come to call "personalized instruction"). Furthermore, an interdisciplinary team of instructors needs to be created, to plan instruction as a group and to work together frequently with students and with supervising teachers in the schools.

Changes such as these do not sound all that revolutionary to many teacher educators. Deep institutional resistance to such change does exist, however. It is entrenched in regental or legislative rules about what constitutes reimbursable activities for professors, for example. There

is also the powerful inertia of centuries of example of what it means to "teach college," which individual professors have to overcome. Team teaching strikes some professors as a real and serious infringement on academic freedom. Many have other, no less powerful resistances. Some hate to surrender the limelight of the lectern, it may be; or they hate to give up the pleasures and comforts of delivering well-organized, long-tested lectures in return for the uncertainties of the "firing line" in public schools. Indeed, we have found that probably no more than fifty percent of college professors ever would convert happily and effectively to an active role in a personalized system of education. There is, needless to say, a continuing place for effective group instruction, either at places within a personalized system or alongside of it.

The greatest resistance to this model of education is thus not really an economic one, but the need for major social engineering, if colleges of teacher education are to conduct themselves according to a different pattern. Merely demonstrating, through research, that a new system produces superior results is not nearly enough to achieve adoption of such a system. Such validity evidence is merely the starting point for a long process of institutional change -- if, indeed, it ever will occur. Hall's work offers some ideas and some useful tools that may facilitate such changes.

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